

How Wheat Production Costs Vary

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Abstract: Data for 1998, from the most recent Agricultural Resource Management Study (ARMS) for wheat farms, show that costs of producing wheat per acre and per bushel varied greatly among wheat growers, due primarily to differences in production practices and yields. The growers in the survey produced wheat at an average total cost of \$3.97 per bushel (or \$166 per acre).

Keywords: wheat, costs of production, cost variation, Agricultural Resource Management Study.

Wheat production costs vary widely across the country because of regional differences in cropping practices, yields, and costs of land, labor, and capital.² This variation can be shown by ranking the wheat farms with the lowest to highest costs per bushel to form a cumulative distribution of farms and production in 1998. Data are from the 1998 Agricultural Resource Management Study (ARMS) of the Wheat Production Practices and Costs Report.³ Such a distribution of operating costs (operating costs include hired labor for this analysis) reveals that 50 percent of farms in the survey incurred operating costs of \$1.40 per bushel or less and 75 percent incurred costs of \$2.00 per bushel or less (fig. B-1). The cumulative distribution of operating and ownership costs reveals that 50 percent of farms in the survey incurred costs of \$2.50 per bushel or less and 75 percent incurred costs of \$3.65 per bushel or less. The study showed that 50 percent of farms in the survey incurred total costs of \$4.10 per bushel or less, and 75 percent incurred total costs of \$6.00 or less (see box for discussion of types of costs).

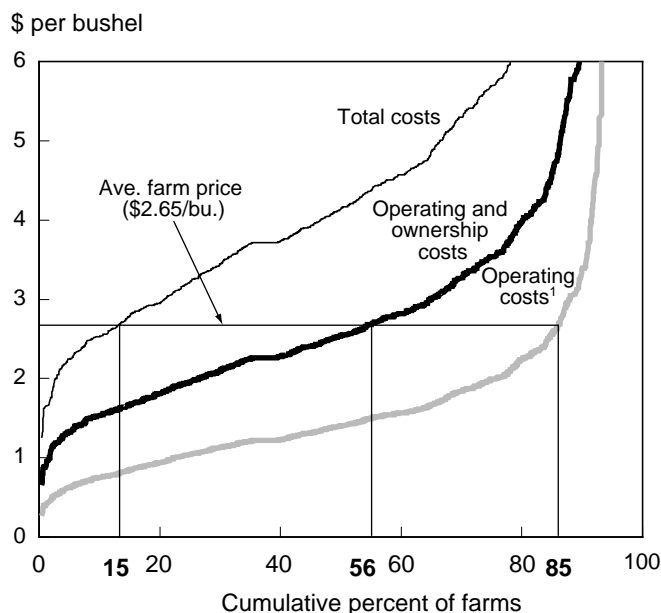
While planted area has dropped over the past few years, this distribution analysis helps to explain why

U.S. farmers have continued to plant wheat despite the low prices of recent years. For example, 85 percent of surveyed wheat farms produced wheat at an operating cost of \$2.65 per bushel or less in 1998. The average farm-level wheat price in the 1998/99 marketing year was \$2.65. However, only about half of U.S. wheat farmers covered both operating and ownership costs at

Figure B-1

Cumulative distribution of farms at different cost levels, 1998

Price at \$2.65 per bushel covered operating costs on more than 80 percent of farms while it covered operating plus ownership costs on just half of the wheat farms.



1/ Operating costs include hired labor.

Source: 1998 USDA Agricultural Resource Management Study.

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² For more information on characteristics of wheat farms at the regional level see Mir Ali, *Characteristics and Production Costs of U.S. Wheat Farms*. Economic Research Service. <http://www.ers.usda.gov/publications/SB974/>. (Forthcoming)

³ Twenty wheat-producing States were included in the survey. Respondents to the wheat survey (1,941 farms) represented 183,373 farms or 57.7 million acres of the 59 million acres planted in 1998.

\$2.65 per bushel. Farmers cannot continue to grow wheat if they cannot cover ownership costs and thus replace capital stock as it deteriorates. When the opportunity costs of land, farmers' labor, and other farm overhead expenses are included, only 15 percent of farmers produced wheat at or below \$2.65 per bushel. The low proportion of farms covering all their costs raises concerns about the long-term sustainability of many wheat producers. Their resources may be able to earn a higher return in other uses.

Although Government program payments are not included in the Economic Research Service (ERS) costs and returns accounts, wheat growers who participated in the program received additional receipts through the marketing assistance loan program, production flexibility contracts, and crop insurance. Also, note that some

wheat producers received income from secondary products such as grazing and wheat straw. While these additional revenues varied widely among wheat growers, the revenues offset some production costs.

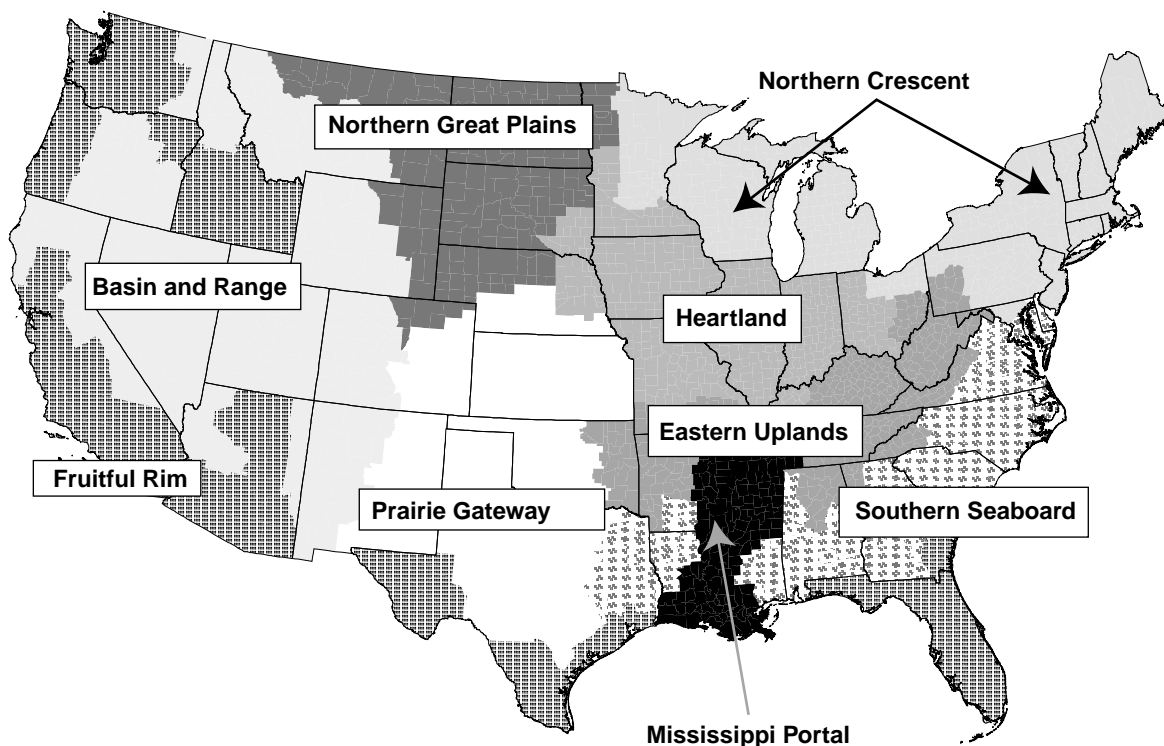
Regional Analysis of Costs And Returns

The national data show that, on average for 1998, aggregate wheat returns were enough to cover aggregate operating costs, but not adequate to cover total costs. Disaggregating the national data to a regional level allows inspection of the variation in costs and returns across the country. For this article, some of the ERS farm resource regions are combined into larger regions (fig. B-2). The Northern Crescent and the Heartland regions are combined into a region called the North Central region, while the Eastern Uplands, Southern Seaboard and Mississippi Portal regions were combined into the Southeast.

Figure B-2

U.S. farm resources regions

In 1998, the Prairie Gateway had the largest share of ARMS wheat farms.



The Northern Crescent and the Heartland regions were combined into the North Central region while the Eastern Uplands, Southern Seaboard and Mississippi Portal regions were combined into the Southeast.

ERS Costs of Production and Returns Accounts

Economic Research Service (ERS) costs of production accounts include estimates of both cash and non-cash costs (sometimes called economic or opportunity costs). Cash costs are incurred when factors of production are purchased or rented. Non-cash costs occur when factors are owned. For example, a farmer who fully owns the land used to produce a commodity (e.g., wheat) has no cost for land rental or loans to pay for purchasing land. Yet, an economic cost arises. By owning the land and using it to grow wheat, the farmer forgoes income from other uses of the land, such as renting it to another producer. If a farmer uses savings to pay for operating inputs, such as fertilizer, chemicals, and fuel, and thus pays no interest on operating loans, the farmer still incurs an economic cost because the savings could have earned a return in another use. Likewise, the farmer has an opportunity cost of his/her labor used in the production of the commodity because it could have been used on another farm or in off-farm employment. The opportunity cost of farm operators' unpaid labor was imputed by using off-farm wage equations for U.S. farm operators based on production region, size of farm, and farm type. Owned farm inputs are not without costs because they are limited and have alternative uses. Non-cash costs in the ERS accounts are estimated using methods recommended by the American Agricultural Association Task Force on Commodity Costs and Returns in 1998.

Returns above total costs in ERS accounts are consistently negative for several commodities over many years. Reasons for negative returns are:

Impact of government programs. Because government payments are excluded from the accounts, the estimated gross value of production is less than what farmers actually receive for being engaged in the enterprise.

Exclusion of marketing costs and returns.

Accounts include only costs associated with crop production and end at the point when the commodity is hauled from the field to storage or directly to market. Production is then valued at the harvest period price. However, farmers often delay sales and store grain with the expectation that the price in later months will exceed the harvest period price plus any costs associated with storing the crop.

Non-cash costs. Accounting methods and measurement procedures used for noncash costs affect costs and return estimates. For example, opportunity costs are used to value capital, land, and unpaid labor. Because of various farm financial arrangements and the unique nature of many farm production inputs, opportunity cost estimates may not exactly represent exactly individual farmers' true opportunity costs.

Southern Seaboard, and Mississippi Portal regions are combined into a region called the Southeast.

The most important wheat-producing regions are the Prairie Gateway and the Northern Great Plains. These two Plains regions accounted for 79 percent of acreage and 70 percent of total U.S. wheat production in 1998. These two regions had the lowest gross returns per acre in the country because they had the lowest yields in that year (table B-1). Per-acre gross returns were higher in the North Central region than the Plains regions because of both higher yields and substantial income from wheat straw. Gross returns per acre were highest in the Basin and Range and the Fruitful Rim regions where irrigation helped produce the highest yields in the country. In the Fruitful Rim, 35 percent of the wheat acres were irrigated on the farms surveyed. In the Basin and Range region, 8 percent of the wheat acres were irrigated.

Per-bushel costs also varied widely across regions. Average operating and ownership costs ranged from a low of \$2.28 per bushel in the North Central region to a high of \$3.12 in the Southeast. The data reflect the substantial effect of weather on yields in some areas. For example, low yields in the Southeast because of dry weather raised costs per bushel higher than if normal yields had been attained. The average total production cost ranged from a low of \$3.63 per bushel in the Prairie Gateway region to a high of \$4.54 in the Southeast. For comparison, the average farm price for all wheat was \$2.65 for the 1998/99 marketing year. The average prices for the previous 1996/97 and 1997/98 marketing years were \$4.30 and \$3.38, respectively.

No region showed enough average returns to cover all costs, indicating that the relatively low prices of 1998 were below long-term sustainable levels. The largest

Table B-1--Wheat production costs and returns per planted acre, by region, 1998

Item	Prairie Gateway	Northern Great Plains	Fruitful Rim	Basin and Range	North Central 1/	Southeast 2/	All ARMS farms
Dollars per planted acre							
Gross value of production	107.15	102.53	173.65	159.23	144.29	121.50	115.07
Wheat grain	104.91	100.79	169.59	158.71	127.25	113.71	111.75
Wheat straw/grazing	2.24	1.74	4.06	0.52	17.04	7.79	3.32
Operating costs 3/							
Seed	5.13	7.64	12.33	10.80	13.26	14.15	7.61
Fertilizer	14.27	14.78	30.97	29.83	37.55	38.40	18.61
Chemicals	3.30	10.61	14.49	16.13	3.70	4.50	7.36
Custom operations	8.07	4.04	13.73	4.36	6.84	12.87	6.77
Fuel, lube, and electricity	7.03	4.25	13.89	6.68	4.32	5.47	6.14
Repairs	8.84	8.10	14.41	13.19	7.08	9.65	9.00
Purchased irrigation water and baling	0.15	0.16	6.04	1.12	0.63	0.21	0.58
Interest on operating capital	1.12	1.19	2.54	1.97	1.76	2.04	1.34
Hired labor	1.77	1.45	6.56	5.02	1.22	4.16	2.12
Ownership costs							
Capital recovery (machinery and equipment)	40.66	41.23	63.31	64.10	38.39	45.40	43.34
Taxes and insurance	3.03	3.76	5.86	7.06	3.33	3.36	3.70
Other costs							
General farm overhead	5.67	6.32	10.12	11.46	7.27	6.06	6.59
Opportunity cost of land	28.18	35.09	76.64	49.50	63.60	38.26	37.52
Opportunity cost of unpaid labor	15.80	10.77	20.52	25.41	16.44	19.56	14.85
Total operating costs	49.68	52.22	114.96	89.10	76.36	91.44	59.53
Total operating and ownership costs	93.37	97.21	184.13	160.26	118.08	140.20	106.57
Total costs	143.02	149.39	291.41	246.63	205.39	204.08	165.53
Returns above							
Operating costs	57.47	102.53	173.65	159.23	144.29	121.50	115.07
Operating and ownership costs	13.78	5.32	-10.48	-1.03	26.21	-18.70	8.50
Total costs	-35.87	-46.86	-117.76	-87.40	-61.10	-82.58	-50.46
Bushels per planted acre							
Actual yield	39.40	34.70	68.60	65.00	51.80	45.00	41.70
Expected yield	36.70	36.20	69.00	60.90	52.20	50.50	41.10
Dollars per bushel							
Price at harvest	2.66	2.91	2.47	2.44	2.46	2.53	2.68
Costs per bushel of actual yield							
Operating costs	1.26	1.50	1.68	1.37	1.47	2.03	1.43
Operating and ownership costs	2.37	2.80	2.68	2.47	2.28	3.12	2.56
Total costs	3.63	4.31	4.25	3.79	3.97	4.54	3.97
Costs per bushel of expected yield							
Operating costs	1.35	1.44	1.67	1.46	1.46	1.81	1.45
Operating and ownership costs	2.54	2.69	2.67	2.63	2.26	2.78	2.59
Total costs	3.90	4.13	4.22	4.05	3.93	4.04	4.03

1/ North Central = Northern Crescent and Heartland production regions. 2/ Southeast = Eastern Uplands, Southern Seaboard, and Mississippi Portal production regions. 3/ Operating costs include hired labor.

Source: 1998 USDA Agricultural Resource Management Study.

shortfalls from covering total costs were in the Fruitful Rim and the Basin and Range regions, with losses ranging from \$87 to \$118 per acre due to irrigation-related expenses. Producers in the two Plains regions had the smallest shortfalls in the country, but these losses were still a very substantial \$36 to \$47 per acre.

Total operating and ownership costs per acre were lowest in the Prairie Gateway and the Northern Great Plains regions. The per-acre operating and ownership costs are much higher in the Fruitful Rim and the Basin and Range regions because of irrigation-related expenses.

Weather conditions in 1998 affected survey results. On average, U.S. wheat yields in the 1998 survey were slightly higher than growers expected based on past years. That year, the United States had a record all-wheat yield, yet total costs still exceeded total returns for every region.

Even so, some areas were adversely affected by weather in 1998. Wheat producers in the Southeast region, in particular, were hard hit by drought in 1998. This region's actual yields were down 6 bushels per acre from expected yields. The expected yield represents the yield farmers reported in the survey that they expected at the time they planted their crop. Wheat producers in the Basin and Range region, on the other hand, benefited from favorable conditions in 1998. Actual yields in this region were 4 bushels per acre above expected yields.

Comparing Low-Cost and High-Cost Producers

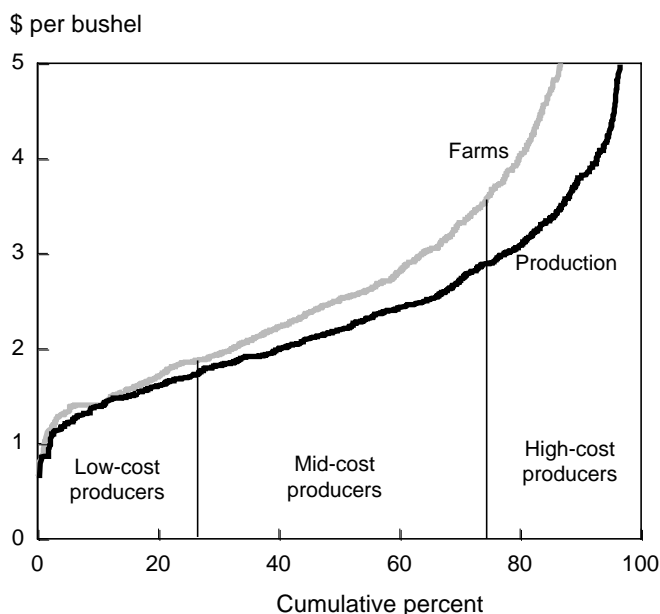
Another view of the cost and return characteristics of the U.S. wheat producers is provided using the cumulative distribution of costs to classify farms into one of three cost categories. The low-cost group is comprised of the 25 percent of farms with the lowest operating and ownership costs, and the high-cost group is comprised of the 25 percent of farms with the highest operating and ownership costs (fig. B-3). Mid-cost farms constitute the remaining 50 percent of the farms.

The low-cost farms had operating and ownership costs of \$1.86 or less per bushel and accounted for a third of the total production on the farms surveyed in 1998 (table B-2). Thirty-five percent of Prairie Gateway wheat farms were in the low-cost group, compared with about 10 percent of farms in the Northern Great Plains, Fruitful Rim, and Southeast (fig. B-4). At the other end

Figure B-3

Cumulative distribution of wheat operating and ownership costs per bushel, 1998

High-cost farms produced wheat for \$3.62 or more per bushel but accounted for only 12 percent of total U.S. wheat production.

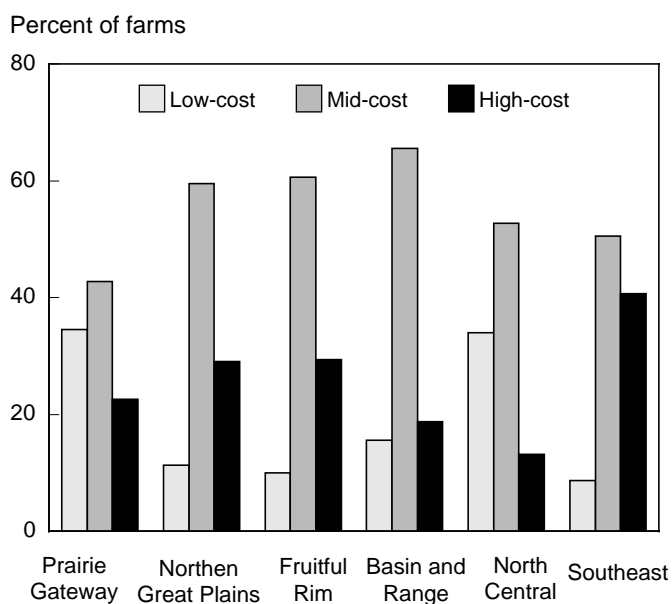


Source: 1998 USDA Agricultural Resource Management Study.

Figure B-4

Distribution of costs groups by region, 1998

Nearly half of the Southeast wheat farms were in the high-cost group.



Source: 1998 USDA Agricultural Resource Management Study.

Table B-2--Wheat production costs and returns, by operating plus ownership cost group, 1998

Item	Low-cost farms 1/	Mid-cost farms 2/	High-cost farms 3/
Dollars per planted acre			
Gross value of production	147.62	120.39	66.08
Wheat grain	143.83	117.25	62.85
Wheat straw/grazing	3.79	3.14	3.23
Operating costs 4/			
Seed	6.45	8.07	7.77
Fertilizer	15.06	20.12	18.80
Chemicals	3.97	8.36	8.65
Custom operations	6.82	7.34	5.31
Fuel, lube, and electricity	4.23	5.64	9.49
Repairs	6.76	8.85	11.86
Purchased irrigation water and baling	0.23	0.74	0.58
Interest on operating capital	1.04	1.42	1.50
Hired labor	1.22	2.39	2.45
Ownership costs			
Capital recovery (machinery and equipment)	33.16	43.32	54.61
Taxes and insurance	3.41	3.80	3.77
Other costs			
General farm overhead	6.33	6.84	6.27
Opportunity cost of land	35.50	39.52	34.81
Opportunity cost of unpaid labor	11.78	14.33	19.53
Total operating costs	45.78	62.93	66.41
Total operating and ownership costs	82.35	110.05	124.79
Total costs	135.96	170.74	185.40
Returns above			
Operating costs	101.84	57.46	-0.33
Operating and ownership costs	65.27	10.34	-58.71
Total costs	11.66	-50.35	-119.32
Bushels per planted acre			
Actual yield	54.7	43.5	23.0
Expected yield	43.2	42.0	36.7
Dollars per planted acre			
Price at harvest	2.63	2.69	2.74
Costs per bushel of actual yield			
Operating costs	0.84	1.45	2.89
Operating and ownership costs	1.51	2.53	5.43
Total costs	2.49	3.93	8.06
Costs per bushel of expected yield			
Operating costs	1.06	1.50	1.81
Operating and ownership costs	1.91	2.62	3.40
Total costs	3.15	4.07	5.05
ARMS share		Percent	
Wheat farms	25	50	25
Wheat acres	24	54	22
Wheat production	32	56	12

1/ Low cost = The 25 percent of producers with the lowest operating and ownership costs.

2/ Mid-cost = The 25 percent of producers in the mid-range of operating and ownership costs.

3/ High-cost = The 25 percent of producers with the highest operating and ownership costs.

4/ Operating costs include hired labor.

Source: 1998 USDA Agricultural Resource Management Study.

of the distribution, the high-cost farms had operating and ownership costs of \$3.62 or more per bushel and accounted for 12 percent of U.S. wheat production. Forty percent of the Southeast wheat producers were in the high-cost group, followed by Northern Great Plains and Prairie Gateway farms with about 30 percent.

While the three groups of farms did have significant per-acre cost differences, these differences become much sharper on a per-bushel basis (table B-2). On a per-acre basis, the total costs of the high-cost producers were 36 percent greater than for the low-cost farms. On a per bushel basis the high-cost group's costs were \$5.43 per bushel, or nearly four times higher than those of the low-cost group. The 1998 returns were adequate to cover all costs for the low-cost producers, but not for the mid- and high-cost producers. The high-cost producers were barely able to cover their operating costs in 1998.

The differences of cost per bushel between the groups are substantially overstated because unusual weather conditions in 1998 affected yields. Favorable weather raised actual yields above expected yields in some regions and lowered yields in other regions. The actual yield for the group of high-cost producers was 14

bushels below what was expected, while low-cost producers surpassed their expected yields in 1998 by an average of 12 bushels per acre (table B-2). On the basis of expected yields, per-bushel operating and ownership costs were still nearly \$1.50 more for high-cost producers than low-cost producers. The data suggest that many of the high-cost producers would be high-cost producers regardless of weather conditions.

Summary

Wheat is grown under a wide range of conditions in the United States, from the humid East to the arid Plains, and even significantly irrigated areas in the Pacific Northwest. Production costs vary widely across this range of climatic/production conditions. With low returns to wheat production, many growers were unable to cover all their production costs. If wheat prices remain low, producers may look for alternative crops that offer higher returns, such as corn, soybeans, and sorghum in areas where they can be grown. Some producers may leave the land fallow, especially in the dry areas. This substitution of competing crops for wheat has been facilitated by legislation passed in the 1990s, allowing crop-planting decisions to be more market oriented.